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6.1 The student will plan and conduct investigations in which			
a)		observations are made involving fine discrimination between similar	
			objects and
			organisms;
b)		a classification system is developed based on multiple attributes;	
c)		precise and approximate measurements are recorded;	
d)		scale models are used to estimate	
			distance,
			volume, and
			quantity;
e)		hypotheses are stated in ways that identify the	
			independent (manipulated) and
			dependent (responding) variables;
f)		a method is devised to test the validity of	
			predictions and
			inferences;
g)		one variable is manipulated over time with many repeated trials;	
h)		data are	
			collected using appropriate metric measurement,
			recorded using appropriate metric measurement,
			analyzed using appropriate metric measurement, and
			reported using appropriate metric measurement;
i)		data are	
			organized through graphical representation (graphs, charts, and diagrams)
			communicated through graphical representation (graphs, charts, and diagrams);
j)		models are designed to explain a sequence; and	
k)		an understanding of the nature of science is	
			developed and
			reinforced.
LS.1 The student will plan and conduct investigations in which			
a)		data are organized into tables showing	
			repeated trials and
			means;
b)		variables are defined;	
c)		metric units (SI-International System of Units) are used;	
d)		models are constructed to	
			illustrate phenomena and
			explain phenomena;

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e)		sources of experimental error are identified;	
f)		dependent variables are identified,	
		independent variables are identified, and	
		constants are identified;	
g)		variables are controlled to test hypotheses and	
		trials are repeated;	
h)		continuous line graphs are	
			constructed,
			interpreted, and
			used to make predictions;
i)		interpretations from a set of data are	
			evaluated and
			defended.
j)		an understanding of the nature of science is	
			developed and
			reinforced.
PS.1 The student will plan and conduct investigations in which			
a)		chemicals are used safely and	
		equipment is used safely;	
b)		the following is accurately measured and reported using metric units (SI-International System of Units);	
			length
			mass,
			volume,
			density,
			temperature,
			weight, and
			force;
c)		conversions are made among metric units, applying appropriate prefixes;	
d)		the following are used to gather data:	
			triple beam and electronic balances,
			thermometers,
			metric rulers,
			graduated cylinders, and
			spring scales;
e)		numbers are expressed in scientific notation where appropriate;	
f)		research skills are utilized using a variety of resources;	

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g)		The following are identified	
			independent variables
			dependent variables,
			constants,
			controls, and
			repeated trials;
h)		data tables showing the following are constructed and interpreted	
			independent variables,
			dependent variables,
			derived quantities, and
			the number of trials;
i)		data tables for the following are constructed and interpreted	
			descriptive statistics showing specific measures of central tendency,
			the range of the data set, and
			the number of repeated trials;
j)		the following are constructed and interpreted	
			frequency distributions,
			scattergrams,
			line plots, and
			histograms;
k)		valid conclusions are made after analyzing data;	
l)		research methods are used to investigate practical problems and questions; and	
m)		experimental results are presented in appropriate written form; and	
n)		an understanding of the nature of science is	
			developed and
			reinforced.
6.2 The student will investigate and understand basic sources of energy, their origins, transformations, and uses. Key concepts include			
a)		potential energy and	
		kinetic energy; and	
e)		energy transformations (heat/light to mechanical, chemical, and electrical energy)	
6.4 The student will investigate and understand that all matter is made up of atoms. Key concepts include			
a)		atoms are made up of	
			electrons,
			protons, and
			neutrons;

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b)			atoms of any element are alike but are different from atoms of other elements;
c)			elements may be represented by chemical symbols;
d)			two or more atoms may be chemically combined;
e)			compounds may be represented by chemical formulas;
f)			chemical equations can be used to model chemical changes; and
g)			a limited number of elements comprise the largest portion of the
			solid Earth,
			living matter,
			the oceans, and
			the atmosphere.
6.5 The student will investigate and understand the unique properties and characteristics of water and its roles in the natural and human-made environment. Key concepts include			
a)			Water as the universal solvent;
b)			the properties of water in all three states;
6.6 The student will investigate and understand the properties of air and the structure and dynamics of the Earth's atmosphere. Key concepts to include			
a)			air as a mixture of gaseous elements and compounds;
PS.2 The student will investigate and understand the basic nature of matter. Key concepts include			
a)			the particle theory of matter;
b)			elements,
			compounds,
			mixtures,
			acids,
			bases, and
			salts;
c)			solids,
			liquids, and
			gases;
d)			characteristics of types of matter based on
			physical properties,
			chemical properties;
e)			physical properties (shape, density, solubility, odor, melting point, boiling point, color); and
f)			chemical properties (acidity, basicity, combustibility, reactivity).

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PS.3 The student will investigate and understand the modern and historical models of atomic structure. Key Concepts include			
a)		the contributions of the following people in understanding the atom	
			Dalton,
			Thomson,
			Rutherford, and
			Bohr; and
b)		the modern model of atomic structure.	
PS.4 The student will investigate and understand the organization and use of the periodic table of elements to obtain information. Key concepts include			
a)		symbols,	
		atomic number,	
		atomic mass,	
		chemical families (groups), and	
		periods,	
b)		classification of elements as	
			metals,
			metalloids, and
			nonmetals; and
c)		simple compounds (formulas and the nature of bonding).	
PS.5 The student will investigate and understand changes in matter and the relationship of these changes to the Law of Conservation of Matter and Energy. Key concepts include			
a)		physical changes	
b)		nuclear reactions (products of fusion and fission and the effects of these products on human and the environment); and	
c)		chemical changes (types of reactions, reactants and products, and balanced equations).	
PS.6 The student will investigate and understand states and forms of energy and how energy is transferred and transformed. Key concepts include			
a)		potential energy,	
		kinetic energy;	
b)		mechanical energy,	
		chemical energy,	
		electrical energy;	
c)		heat,	
		light,	
		sound.	

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PS.7 The student will investigate and understand temperature scales, heat, and heat transfer. Key concepts include			
a)		Celsius temperature scales,	
		Kelvin temperature scales, and	
		absolute zero;	
b)		phase change,	
		freezing point,	
		melting point,	
		boiling point,	
		vaporization, and	
		condensation	
c)		conduction,	
		convection,	
		radiation; and	
d)		applications of heat transfer	
			heat engines,
			thermostats,
			refrigeration, and
			heat pumps
PS.8 The student will investigate and understand characteristics of sound and technological applications of sound waves. Key concepts include			
a)		wavelength,	
		frequency,	
		speed, and	
		amplitude;	
b)		resonance;	
c)		the nature of mechanical waves; and	
d)		technological applications of sound.	
PS.9 The student will investigate and understand the nature and technological applications of light. Key concepts include			
a)		the wave behavior of light	
			reflection,
			refraction,
			diffraction, and
			interference;
b)		images formed by	
			lenses and
			mirrors; and
c)		the electromagnetic spectrum.	

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PS.10 The student will investigate and understand scientific principles and technological applications of work, force, and motion. Key concepts include			
a)		speed,	
		velocity, and	
		acceleration;	
b)		Newton's laws of motion;	
c)		work,	
		force,	
		mechanical advantage,	
		efficiency, and	
		power; and	
d)		applications	
			simple machines,
			compound machines,
			powered vehicles,
			rockets,
			restraining devices
PS.11 The student will investigate and understand basic principles of electricity and magnetism. Key concepts include			
a)		static electricity,	
		current electricity, and	
		circuits;	
b)		magnetic fields and	
		electromagnets; and	
c)		motors and	
		generators.	
LS.2 The student will investigate and understand that all living things are composed of cells. Key concepts include			
a)		cell structure and organelles (cell membrane, cell wall, cytoplasm, vacuole, mitochondrion, endoplasmic reticulum, nucleus, and chloroplast);	
b)		similarities and differences between plant and animal cells;	
c)		development of cell theory; and	
d)		cell division	
			mitosis and
			meiosis.

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LS.3 The student will investigate and understand that living things show patterns of cellular organization. Key concepts include			
a)		cells,	
		tissues,	
		organs, and	
		systems; and	
b)		life functions and processes of cells, tissues, organs, and systems	
			respiration,
			removal of wastes,
			growth,
			reproduction,
			digestion, and
			cellular transport
LS.4 The student will investigate and understand that the basic needs of organisms must be met in order to carry out life processes. Key concepts include			
a)		plant needs (light, water, gases, nutrients);	
b)		animal needs (food, water, gases, shelter, space); and	
c)		factors that influence life processes.	
LS.5 The student will investigate and understand how organisms can be classified. Key concepts include			
a)		the distinguishing characteristics of kingdoms of organisms;	
b)		the distinguishing characteristics of major	
			animal phyla, and
			plant phyla; and
c)		the characteristics of the species.	
LS.6 The student will investigate and understand the basic physical and chemical processes of photosynthesis and its importance to plant and animal life. Key concepts include			
a)		energy transfer between sunlight and chlorophyll;	
b)		transformation of water and carbon dioxide into sugar and oxygen; and	
c)		photosynthesis as the foundation of virtually all food webs.	
LS.13 The student will investigate and understand that organisms reproduce and transmit genetic information to new generations. Key concepts include			
a)		the role of DNA;	
b)		the functions of genes and chromosomes;	
c)		genotypes and	
		phenotypes;	

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d)			factors affecting the expression of traits;
e)			characteristics that can and cannot be inherited;
f)			genetic engineering and its applications; and
g)			historical contributions and
			significance of discoveries related to genetics.
LS.14 The student will investigate and understand that organisms change over time. Key concepts include			
a)	the relationships of		
			mutation,
			adaptation,
			natural selection, and
			extinction.
6.7 The student will investigate and understand the natural processes and human interactions that affect watershed systems. Key concepts include			
a)			the health of ecosystems and
			the abiotic factors of a watershed;
b)			the location and structure of Virginia's regional watershed systems;
c)			divides,
			tributaries,
			river systems, and
			river and stream processes;
d)			wetlands;
e)			estuaries;
f)			major conservation issues associated with watersheds,
			health issues associated with watersheds,
			safety issues associated with watersheds; and
g)			water monitoring and analysis using field equipment including hand-held technology.
LS.7 The student will investigate and understand that organisms within an ecosystem are dependent on one another and on nonliving components of the environment. Key concepts include			
a)		the following cycles	
			carbon,
			water, and
			nitrogen;

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b)		interactions resulting in a flow of energy and matter throughout the system;	
c)		complex relationships within	
			terrestrial ecosystems,
			freshwater ecosystems, and
			marine ecosystems; and
d)		energy flow in	
			food webs and
			energy pyramids.
LS.8 The student will investigate and understand that interactions exist among members of a population. Key concepts include			
a)		competition,	
		cooperation,	
		social hierarchy,	
		territorial imperative; and	
b)		influence of behavior on a population.	
LS.9 The student will investigate and understand interactions among populations in a biological community. Key concepts include			
a)		the relationship among producers, consumers, and decomposers in food webs;	
b)		the relationship between predators and prey;	
c)		competition and	
		cooperation;	
d)		symbiotic relationships and	
e)		niches.	
LS.10 The student will investigate and understand how organisms adapt to biotic and abiotic factors in an ecosystem. Key concepts include			
a)		differences between ecosystems and biomes;	
b)		characteristics of	
			land ecosystems,
			marine ecosystems,
			freshwater ecosystems; and
c)		adaptations that enable organisms to survive within a specific ecosystem.	

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LS.11 The student will investigate and understand that ecosystems, communities, populations, and organisms are dynamic and change over time (daily, seasonal, and long term). Key concepts include			
a)		phototropism,	
		hibernation, and	
		dormancy;	
b)		factors that increase or decrease population size; and	
c)		eutrophication,	
		climate changes, and	
		catastrophic disturbances.	
LS.12 The student will investigate and understand the relationships between ecosystem dynamics and human activity. Key concepts include			
a)		food production and	
		harvest;	
b)		change in habitat	
			size,
			quality, and
			structure;
c)		change in species competition; and	
d)		population disturbances and factors that	
			threaten species survival
			enhance species survival.
e)		environmental issues	
			water supply,
			air quality,
			energy production, and
			waste management
6.2 The student will investigate and understand basic sources of energy, their origins, transformations, and uses. Key concepts include			
b)		the role of the sun in the formation of most energy sources on Earth;	
c)		nonrenewable energy sources (fossil fuels) including	
			petroleum,
			natural gas,
			and coal;

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d)		renewable energy sources	
			wood,
			wind,
			hydro,
			geothermal,
			tidal,
			and solar
6.3 The student will investigate and understand the role of solar energy in driving most natural processes within the atmosphere, the hydrosphere, and on the Earth's surface. Key concepts include			
a)		the Earth's energy budget;	
b)		the role of	
			radiation in the distribution of energy;
			convection in the distribution of energy;
c)		the motion of	
			the atmosphere
			and the oceans;
d)		cloud formation; and	
e)		the role of heat energy in weather-related phenomena including	
			thunderstorms and
			hurricanes.
6.5 The student will investigate and understand the unique properties and characteristics of water and its roles in the natural and human-made environment. Key concepts include			
c)		the action of water in	
			physical weathering and
			chemical weathering;
d)		the ability of large bodies of water to	
			store heat and
			moderate climate;
e)		the origin of water on Earth;	
		the occurrence of water on Earth;	
f)		the importance of water for	
			agriculture,
			power generation,
			and public health; and
g)		the importance of	
			protecting water resources and
			maintaining water resources

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6.6 The student will investigate and understand the properties of air and the structure and dynamics of the Earth's atmosphere. Key concepts include			
b)		air pressure,	
		temperature, and	
		humidity;	
c)		how the atmosphere changes with altitude;	
d)		natural changes to the atmosphere and	
		human-caused changes to the atmosphere;	
e)		the relationship of atmospheric measures and weather conditions;	
f)		basic information from weather maps including	
			fronts,
			systems, and
			basic measurements; and
		the importance of	
			protecting air quality and
			maintaining air quality.
g)		the importance of	
			protecting water sources
			maintaining water sources
6.8 The student will investigate and understand the organization of the solar system and the relationships among the various bodies that comprise it. Key concepts include			
a)		the sun,	
		moon,	
		Earth,	
		other planets and their	
			moons,
			meteors,
			asteroids, and
			comets;
b)		relative size of planets and	
		relative distance between planets;	
c)		the role of gravity;	
d)		revolution and	
		rotation;	
e)		the mechanics of day and night and	
		the phases of the moon;	
f)		the unique properties of Earth as a planet;	

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g)		the relationship of the Earth's tilt and the seasons;	
h)		the cause of tides; and	
i)		the history of space exploration and	
		the technology of space exploration.	
6.9 The student will investigate and understand public policy decisions relating to the environment. Key concepts include			
a)		management of renewable resources	
			water,
			air,
			soil,
			plant life,
			animal life;
b)		management of nonrenewable resources	
			coal,
			oil,
			natural gas,
			nuclear power,
			mineral resources;
c)		the mitigation of land-use through preventive measures and	
		the mitigation of environmental hazards through preventive measures; and	
d)		cost/benefit tradeoffs in conservation policies.	
LS.14 The student will investigate and understand that organisms change over time. Key concepts include			
b)		evidence of evolution of different species in the fossil record; and	
c)		how environmental influences can lead to diversity of organisms	
		how genetic variation can lead to diversity of organisms	

Submit Quarterly to the building level administrator/designee for review:

Date Submitted/Initials	Date Submitted/Initials	Date Submitted/Initials	Date Submitted/Initials